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Prevalence, Phylogroups and Antimicrobial Susceptibility of *Escherichia coli* Isolates from Food Products

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Abstract: The emergence of multi-drug resistant *E. coli* is an important matter of increasing considerable concern to global public health. The aim of this study was to investigate the incidence, antibiotic resistance pattern and phylogroups of *E. coli* isolates obtained from raw milk, vegetable salad and ground meat samples collected from Qazvin Province (Iran). Culture-based techniques, Kirby-Bauer disk diffusion susceptibility testing and PCR assays were used to determine the incidence rate, antimicrobial resistance pattern and phylogenetic groups of the *E. coli* isolates. The *E. coli* isolates were highly resistant to amoxicillin (79.1%), trimethoprim-sulfamethoxazole (70.8%), amoxicillin-clavulanic acid (62.5%), tetracycline (54.1%), chloramphenicol (54.1%), nitrofurantoin (54.1%), ampicillin (45.8%), streptomycin (45.8%), and kanamycin (33.3%); and completely susceptible to norfloxacin and azithromycin and 70.8% of the isolates were multi-drug resistant. Most *E. coli* isolates (46%) belonged to phylogroup A. Novel, practical, efficient food safety control and surveillance systems of multi-drug resistant foodborne pathogens are required to control the foodborne pathogen contamination.

Keywords: *Escherichia coli*; antimicrobial resistance; food samples; phylogenetic group

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1. Introduction

Foodborne diseases are defined as disorders caused by agents (bacteria, fungi, viruses, parasites and chemicals) that are usually either toxic or infectious in nature and enter the human body through the ingestion of food or drinks [1]. Foodborne bacteria are the main microbial factors causing foodborne diseases with significant adverse effects on human health and economic well-being. Foodborne pathogens can induce mild to severe both intestinal and extra-intestinal symptoms in humans [2]. The World Health Organization (WHO) has estimated that considered foodborne hazards caused more than 600 million foodborne diseases leading to more than 33 million disability-adjusted life years and 420,000 deaths annually worldwide [3]. The global burden of foodborne illnesses is comparable to those of the main infectious diseases such as tuberculosis, HIV and malaria; and certain risk factors including unimproved sanitation, air pollution and dietary risk factors [4]. At least 90% of all foodborne diseases are caused by diarrheal disease agents, indicating that many diarrheal illnesses are pathologically benign. The most prevalent foodborne pathogens contributing to the global burden of diarrheal illnesses have been reported to be noroviruses, *Campylobacter* spp., *Escherichia coli*, *Salmonella* spp., *Shigella* spp., *Giardia* spp., and *Entamoeba histolytica*. *E. coli* is one of the main challenges and concerns in food safety and public health [3].

Escherichia coli is a Gram-negative rod-shaped facultative anaerobic bacterium belonging to the *Enterobacteriaceae* family. *E. coli* is a commensal bacterium and typical inhabitant of the gastrointestinal tract of warm-blooded animals such as mammals, including human,